

Vegetative Treatment Systems: Integrating Extension and Research



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My research and Extension interests

- Ambient odor measurement, odor, odor dispersion modeling, emissions, odor footprint tool, and odor policy.
- Development and demonstration of alternative systems, Vegetative Treatment Systems for small animal feeding operations
- Design, permitting, and performance of VTS for large CAFO feedlots.
- Livestock Environmental Regulation
- Land application training for producers and custom applicators



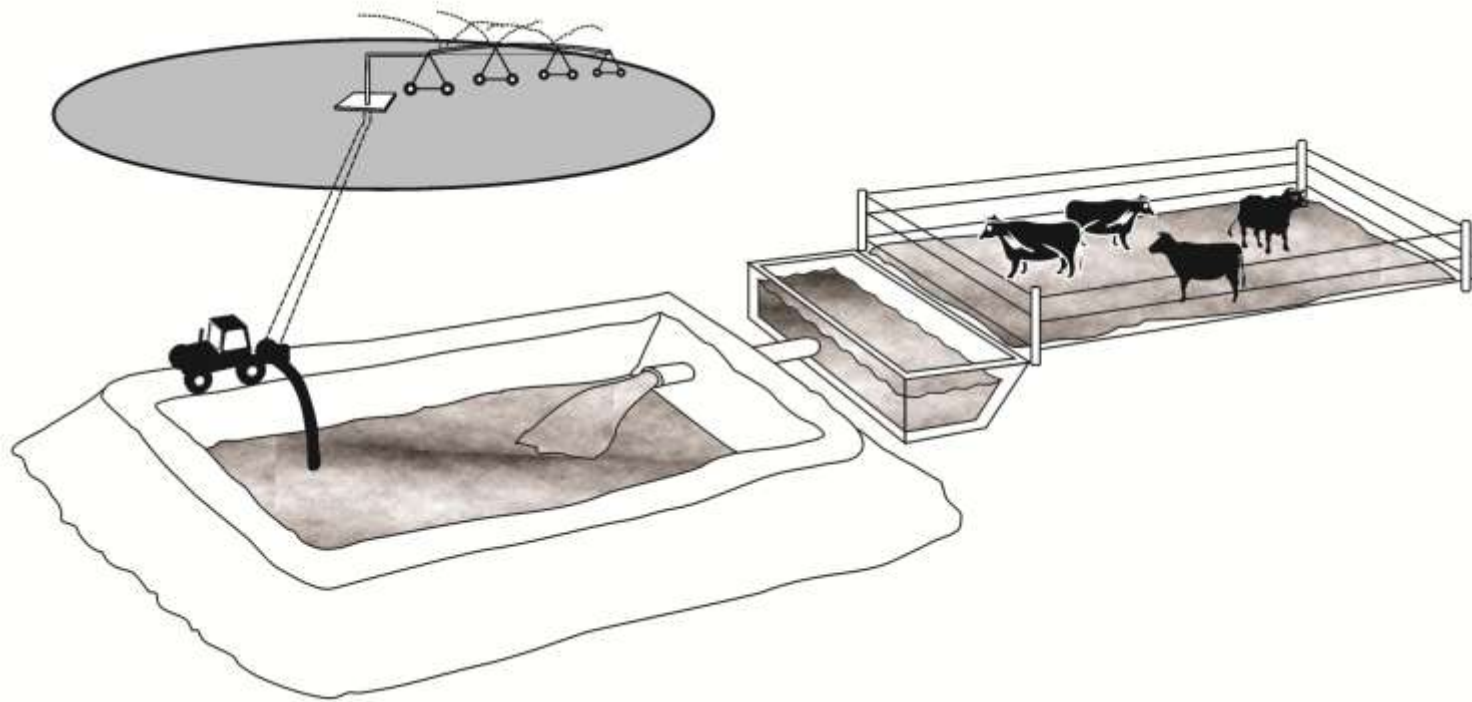


LIVESTOCK PRODUCERS ENVIRONMENTAL ASSISTANCE PROJECT

**Nebraska Environmental Trust Fund
NDEQ 319 Non-Point Pollution Program Grant**

- 
- Develop and demonstrate new alternative practices for un-regulated livestock producers through a small cost share program
 - Design and build projects on small and medium livestock operations under real world conditions.
 - Educate Producers and Consultants about using VTS

The convention for open lot runoff management

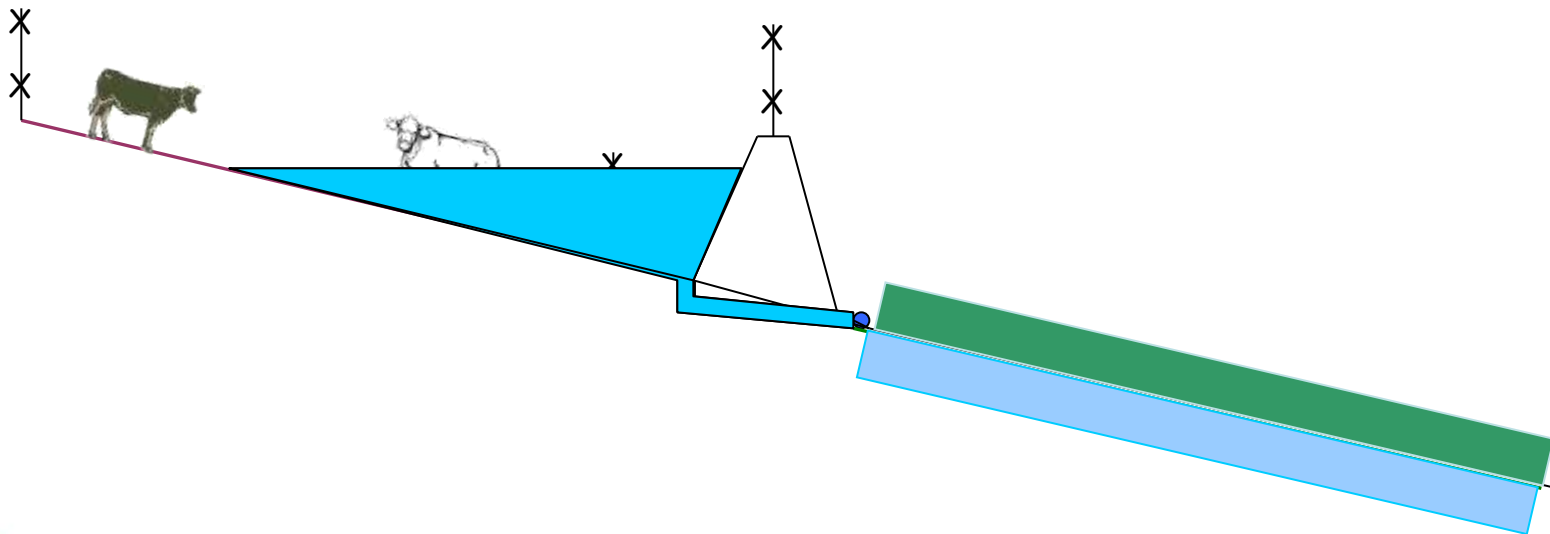
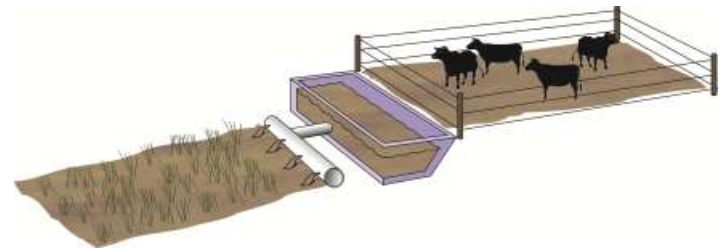


- Apply stored runoff when crops are not growing (spring and fall)

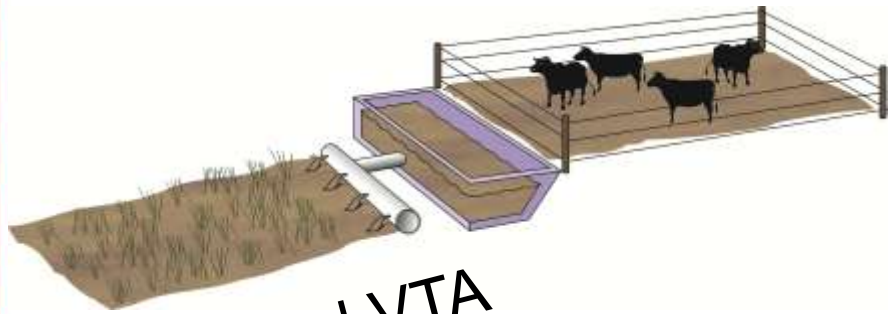


Vegetative Treatment System components

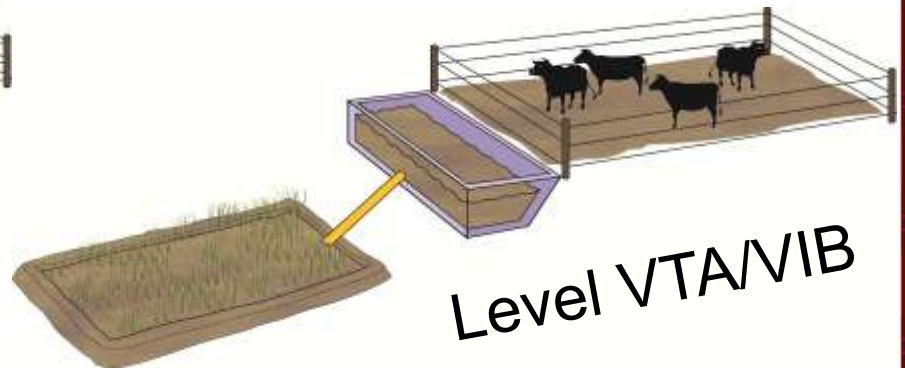
- Sediment Basin
- Outlet Structure
- Conveyance (pipe and/or pump)
- Distribution System
 - Concrete spreaders
 - Gated pipe
 - Sprinklers
- Vegetative Treatment Area



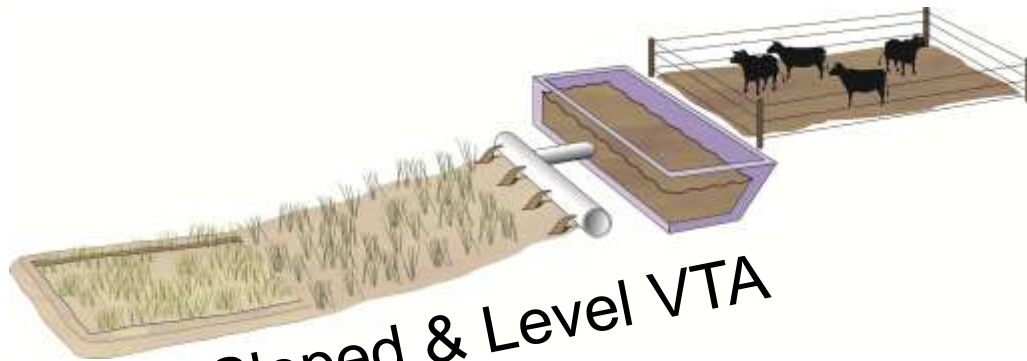
Many flavors of VTS



Sloped VTA



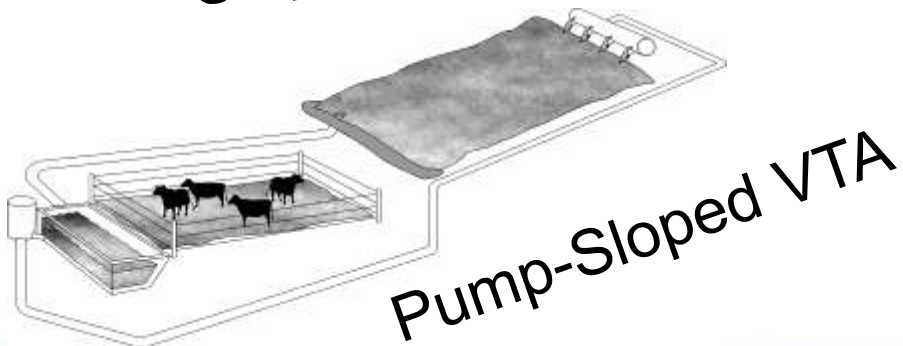
Level VTA/VIB



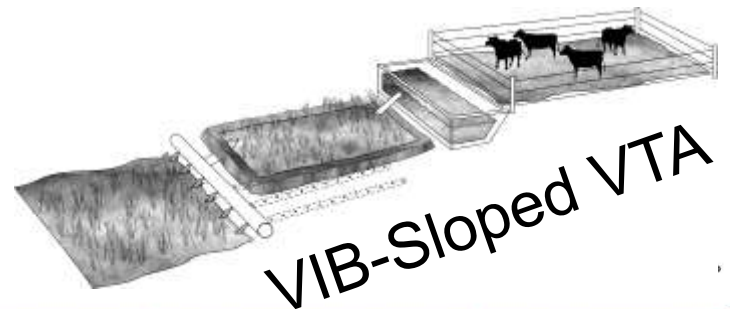
Sloped & Level VTA



Sprinkler VTA

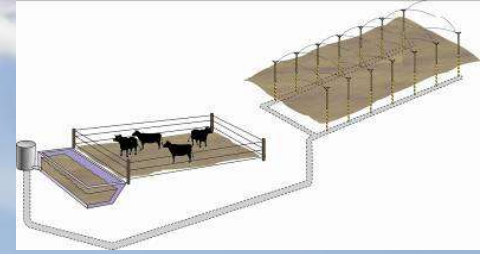


Pump-Sloped VTA



VIB-Sloped VTA

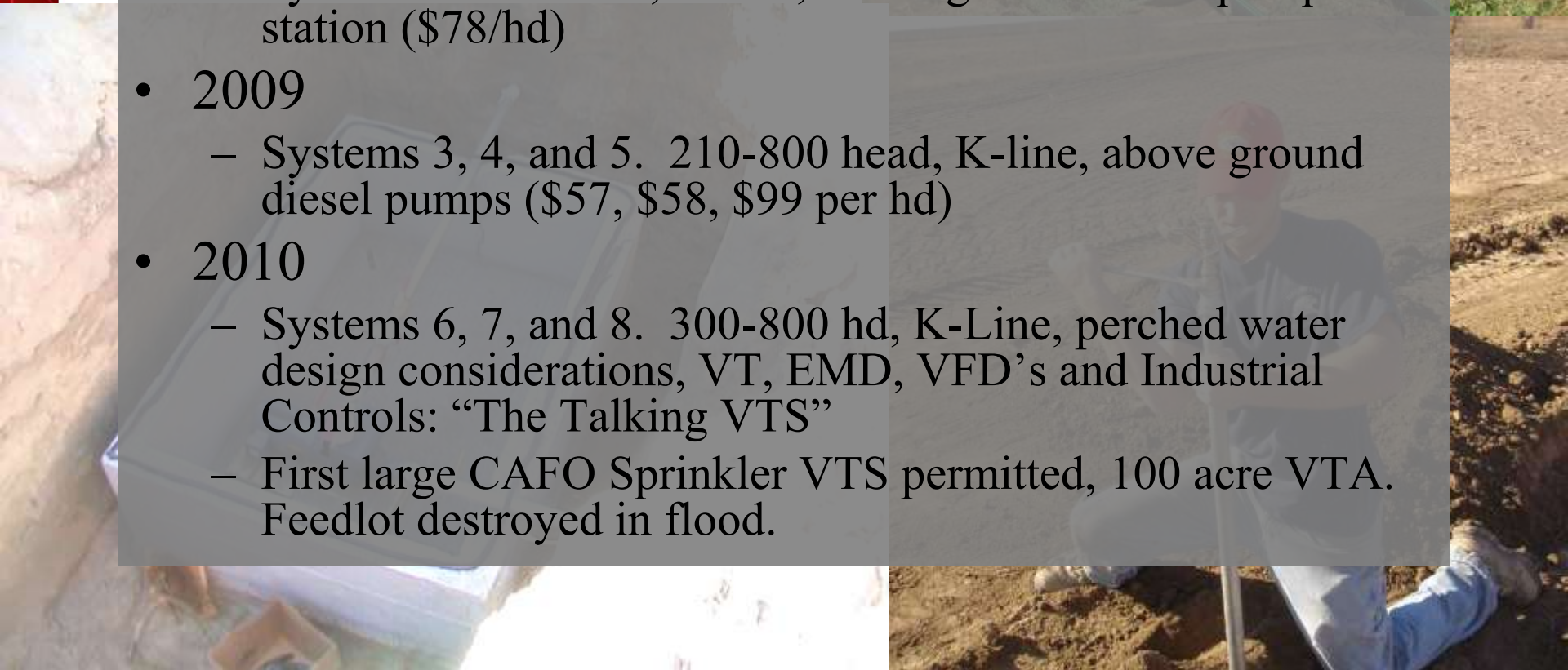
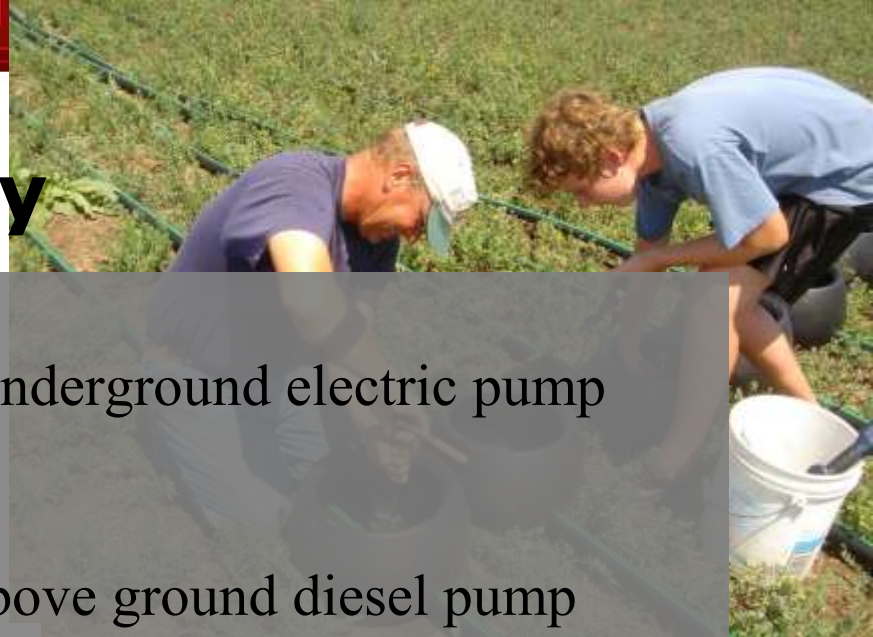
Sprinkler VTA Concept



- Feeding area is down gradient of the possible VTA location
- Soil intake rate is too high for a flood application system (sandy / loess soils) or too low (very tight clay soils)
- Topography challenges (rolling hills or short slopes)
- No prone to rill and gulley erosion, sheet flow issues
- Sensitive water table, low AWC of the soil, and many other reasons

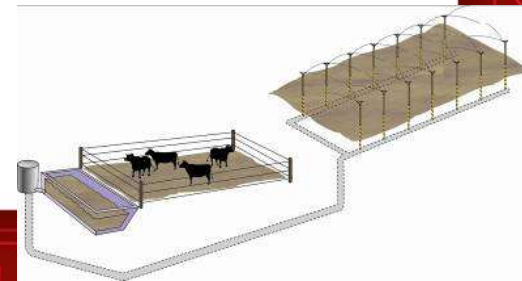
Sprinkler VTS History

- 2005
 - System 1: 80 head, solid set, underground electric pump station (\$209/hd)
- 2007
 - System 2: 450 head, K-line, above ground diesel pump station (\$78/hd)
- 2009
 - Systems 3, 4, and 5. 210-800 head, K-line, above ground diesel pumps (\$57, \$58, \$99 per hd)
- 2010
 - Systems 6, 7, and 8. 300-800 hd, K-Line, perched water design considerations, VT, EMD, VFD's and Industrial Controls: "The Talking VTS"
 - First large CAFO Sprinkler VTS permitted, 100 acre VTA. Feedlot destroyed in flood.



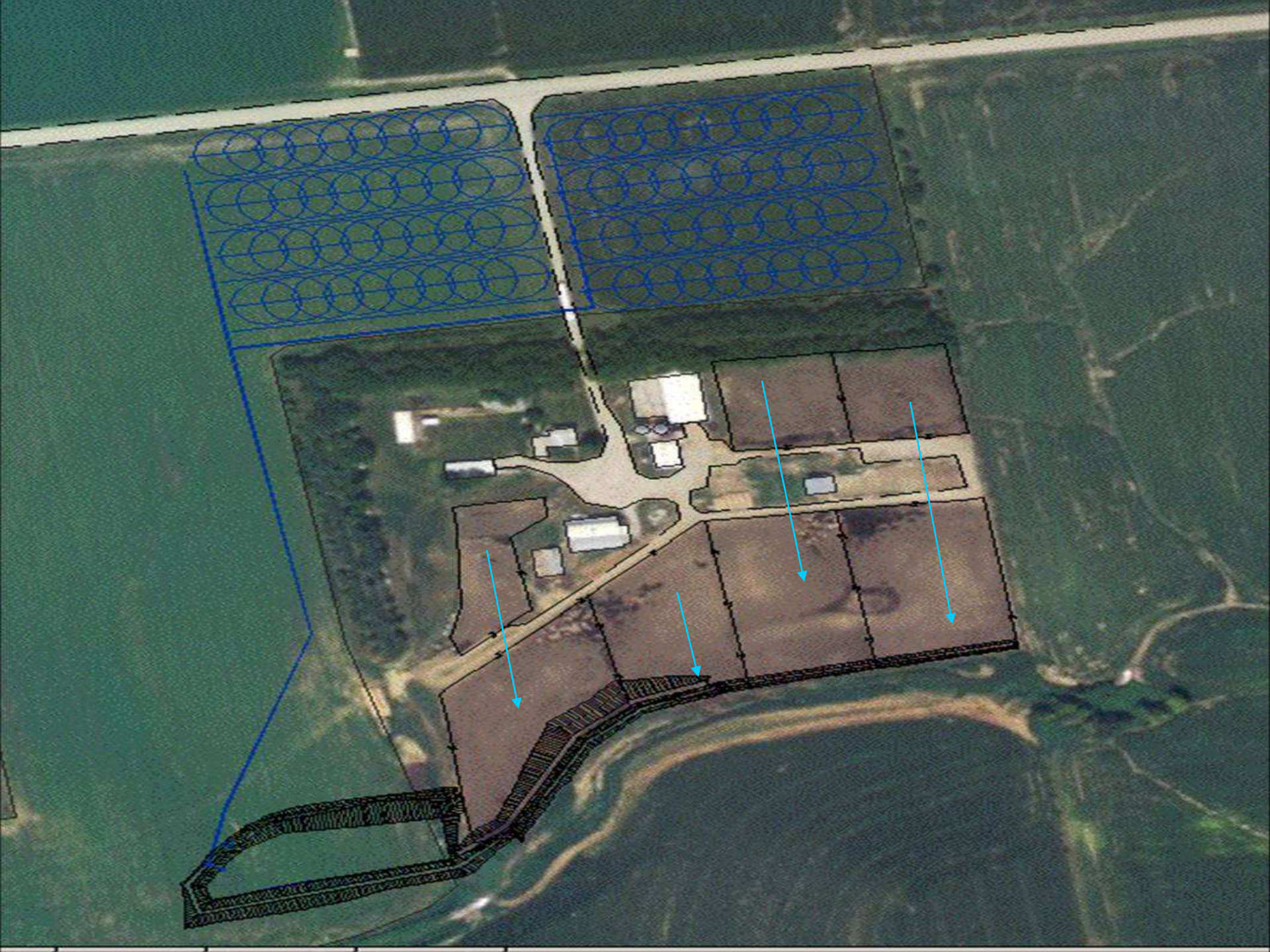
Sprinkler VTS (largest built to date)

- 800 head 6.5 ac feedlot (350 sq ft. per calf) plus 1 ac contributing
- VTA is 8.6 ac (ratio VTA:FLOT, 1.35:1)
- Additional cropland as land application area 4.3 ac (2:1)
- Excavation \$12,000
- K-Lines \$9,450 8 lines with 9 pods
- Engine (30 HP) and Pump \$5,526
- Pipeline, fittings, filters \$18,752
- Fence removal, seeding, rebuild fencing \$13,177
- Total \$58,919 (\$57/hd VTS only, \$73/head inc fence, \$9,206/feedlot ac)
- Grass is seeded to: orchard grass, intermediate wheatgrass, meadow brome, and creeping foxtail











Pump Inlet System



**Unfinished, picket
dam and strainer not
installed**













LIVING

Revolutionary process



ARMED WITH
pumps, hoses, and
a lot of hard work,
the team has
created a new
method of water
treatment that
is both effective
and efficient.
The system is
designed to be
used in a variety
of settings, from
small farms to
large commercial
operations. It
can be used to
treat water from
a variety of
sources, including
wells, streams,
and ponds. The
system is also
designed to be
easy to install
and maintain.



The Nebraska
Environmental Trust



Livestock Producer
Environmental Assistance
Project

UNIVERSITY OF NEBRASKA-LINCOLN

Vegetative Treatment System for Feedlots

Mel Meister Sprinkler Vegetative Treatment System

Project Description

This VTS collects runoff and solids from the feedlot using a sediment basin and the liquids are transferred to a Vegetative Treatment Area planted to intermediate wheatgrass, creeping foxtail, orchard grass and brome grass. Runoff is transferred to the VTA with a 30 hp diesel pump and distributed using impact sprinklers fixed to portable K-Line pods. A VTS is an alternative to a holding pond. To evaluate these systems, livestock producers volunteer to install and demonstrate these systems. This Sprinkler VTS was developed by UNL Extension. When constructed in 2009 this was the largest known sprinkler VTS ever constructed in the United States.



University of Nebraska Extension, Nebraska Department of Environmental Quality, Nebraska Farm Bureau, Nebraska Cattlemen, Nebraska Department of Agriculture, Nebraska Park Producers Association, Little Blue NHD, Central Platte NHD, Ralstonwater Basin Joint Venture, Natural Resources Conservation Service

For more information on this project contact your local Extension office or afo.unl.edu



Nebraska
Lincoln

I can scan your
VTA with this yellow
tube thing and you
will be blessed by
by the EMI Gods.



Cool Tour



**Has USDA
gone too far
tracking the
whereabouts
of their ARS
scientists?**



Large CAFO VTS Research

- In 2003, EPA rule allowed for “Alternative Performance Standards”
- VTS’s on “probation” from EPA
- NE built 2 large CAFO VTS sites, NPDES permitted. Less than 12 in US.
- 3 yr multi-state project (IA, SD, NE) just completed for monitoring performance of large CAFO VTS
- Already collaborating with Dr’s Durso, Miller, & Snow.





Large CAFO Performance in 2009

Site	Cattle	Feedlot Area	VTS Area	2009 Rainfall	Effluent Released				Percent Runoff
					Animal Basis †		Area Basis‡		
					SSB	VTA	SSB	VTA	
Head	Hectares	Hectares	cm	SSB	VTA	SSB	VTA	Controlled	
Central NE 1±	1200	4.8	4.45	79.0	9.9	3.0	24.8	7.6	94/100
Central IA 1	1000	3.09	1.53	63.2	10.8	0.0	34.8	0.0	100
Southwest IA 2	1200	3.72	3.46	70.0	11.5	0.0	37.0	0.0	100
Western MN 1	1750	3.56	3.52	56.7	2.7	0.0	13.1	0.0	100
Northwest IA 1	1400	2.91	1.68	68.1	9.8	1.2	46.9	5.5	88
Northwest IA 2±	4000	2.96	1.91	70.3	2.7	0.5	36.9	7.2	81
Southwest IA 1	2300	7.49	4.0	79.8	10.9	3.5	33.4	10.7	68
Central IA 2	650	1.07	0.56	82.4	3.9	4.2	23.8	25.3	-6
Central NE 2*	1700	4.8	3.8	57.7	---	2.6	---	9.4	---

* SSB concentration data from this site is unavailable due to monitoring difficulties

± Site utilizes an effluent recycle pipe

Opportunities for VTS Demonstrations

- 36 small AFO demonstration projects in Nebraska
- Large CAFO flow instrumented site
- Most diversity of VTS system types in NE than anywhere in US
- Research Questions:
 - Longevity of systems and fate of nutrients in VTA (N loss in sprinklers vs gravity)
 - Nutrient loads from VTA's compared to application of manure from land application

(Agricultural Storm Water Exemption is going to be revisited)



Livestock Producer Regulatory Opportunities for Research Impact

- P-Index
- Nitrogen-transport risk tool
 - *The outcome of the field-specific assessment of the potential for nitrogen and phosphorus transport from each field;*
- Buffers and setbacks
 - *For large concentrated animal feeding operations, manure, litter, and process wastewater may not be stockpiled or applied closer than 100 feet to any down-gradient surface waters, open tile line intake structures, well heads, or other conduits to surface or ground water...*
- Runoff risk from Manure Stockpiles
 - *Stockpiles of livestock waste shall be located to prevent a discharge to waters of the state. If a discharge is possible, the stockpile shall be managed by use of cover material, diking, or other means to prevent discharge until the stockpile material is utilized. Stockpiles placed on land application sites shall be removed during the succeeding cropping season.*
- Voluntary Alternative Performance Standards for large CAFO's.
 - Much to learn about VTS technology and performance

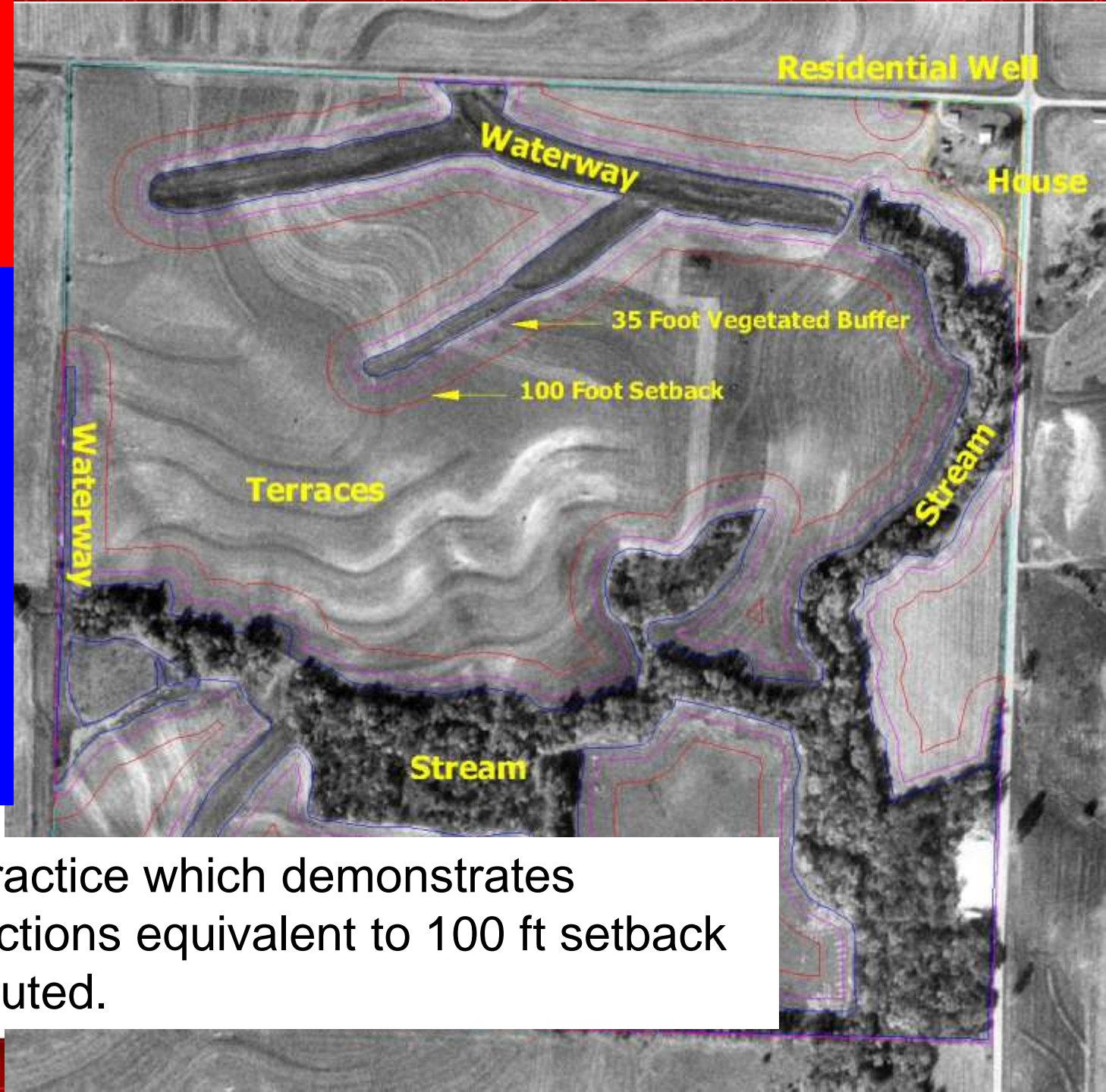


Buffers or Setbacks?

Tillable Acres
119 acres

35' Vegetative
Buffer
101 acres

100' Setbacks
71 acres

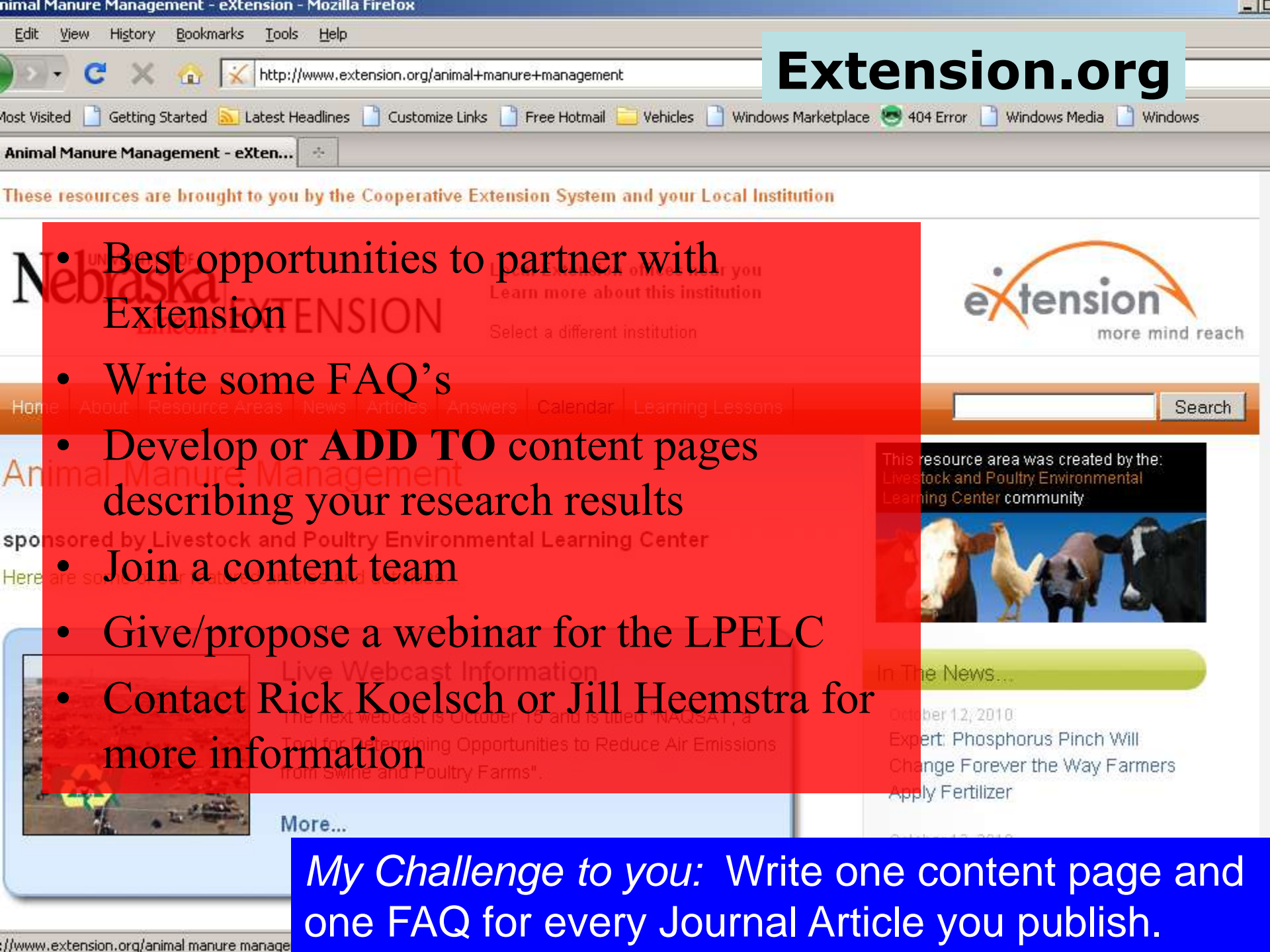


“Alternative practice which demonstrates pollutant reductions equivalent to 100 ft setback can be substituted.

NRCS: Conservation Stewardship Program

- Producers who enroll in CSP have the option to take advantage of this enhancement by working directly with research institutions and committing to this option in their CSP contract.
- CSP contracts are five years in length and producers who select this enhancement increase their conservation performance ranking and conservation payment points.
- Eligible projects must fit within broad national technology focus areas contained in the bulletin i.e. soil quality, soil erosion, water quality, water quantity, air quality, plants, wildlife, energy conservation, etc.
- On-farm research and demonstrations consist of the implementation of applied research projects on working farms to gather information and demonstrate the efficacy of an activity.
- Research projects must be conducted by an entity that is seeking to determine the value of a conservation practice, component, treatment, or process.
- On-farm pilot projects consist of the installation, monitoring, and publicizing of projects that showcase practices, components, or management techniques that have shown environmental benefits through research but are not widely used by farmers in the project area.
- No research funding is available, just an incentive for the producer





Extension.org

Animal Manure Management - eXten...

These resources are brought to you by the Cooperative Extension System and your Local Institution

Nebraska
UNIVERSITY OF NEBRASKA
Extension
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Animal Manure Management

sponsored by Livestock and Poultry Environmental Learning Center

Here are some of our data collection and tools

- Best opportunities to partner with Extension
- Write some FAQ's
- Develop or **ADD TO** content pages describing your research results
- Join a content team
- Give/propose a webinar for the LPELC
- Contact Rick Koelsch or Jill Heemstra for more information

This resource area was created by the:
Livestock and Poultry Environmental
Learning Center community



In The News...

October 12, 2010:
Expert: Phosphorus Pinch Will
Change Forever the Way Farmers
Apply Fertilizer

My Challenge to you: Write one content page and one FAQ for every Journal Article you publish.

North American Manure Expo will be in Norfolk, Nebraska July 20, 2011



**Manure application equipment demonstrations
Land application training
Ride-and-Drive equipment
Latest research in Manure Handling Technology
In-field demonstrations of accident response
Sprinkler Application of Manure**

Take home message

- Partner with an Extension Professional to channel research to end users
- Conduct Research on a Demonstration Site as a path to direct application of research to the end user
- Convey the lessons learned from your research through an Extension resource (extension.org)

